Energy - the ability to do work. The more energy something has, the more work it can do.

Kinetic energy - energy that is produced by the movement of an object.

Renewable Energy - energy from a source that is not depleted when it is used, or is naturally replenished on a human timescale.

Non-renewable Energy - energy from a source that takes millions of years to form and cannot be made in a short time. Includes fossil fuels.

Energy sources - wind, solar power, thermal, nuclear energy, hydroelectricity, geothermal, fossil fuels. Energy is neither lost or gained within the universe.

Solar - renewable energy that is produced by the sun.

Wind energy - a form of renewable energy that uses wind to generate electricity.

Geothermal energy - heat produced inside of the earth that can be harnessed. Hot water and steam are pumped out of the ground and the thermal energy is used to generate electricity. The cooled water is then pumped back into the ground where it is reheated. A renewable source of energy.

Hydroelectricity/Hydropower - a form of renewable energy that uses moving water to generate electricity.
Thermal energy – Heat. The movement of atoms and particles in an object. The faster the particles move, the more heat is produced.

Biomass – biomass is any organic matter that can be used as an energy source (wood, animal waste, plants, etc).

Four energy sectors: transportation, industrial, electrical power, and residential and commercial

Fossil Fuel – remains of plants and animals that died hundreds of millions of years ago. They sank to the bottom of the oceans, buried by thousands of feet of sediment and sand that turned into rock. Time + pressure + heat = chemical change to oil saturated rock

Hydrocarbon- hydrogen and carbon atoms

Molecule – A group of atoms bonded together

Atoms – the basic particle of chemical elements. They consist of neutrons and electrons.

Natural Gas – known as petroleum – a non-renewable energy source- trapped in porous rocks deep underground- major uses – heating, industry, electricity. Most commonly methane. Where can natural gas be found?...

Petroleum – oil, a fossil fuel and a non-renewable energy source - crude oil, kerosene, and gasoline

Hydraulic “fracking”– the process of injecting pressurized liquid into the ground to break up bedrock and free trapped oil or gas.
**Horizontal Drilling** - a vertical well is drilled to a rock formation that is known to have natural gas, then the drill turn 90 degrees to run parallel to the formation. Maximizes the amount of natural gas recovered.

**Coal** - a fossil fuel created from the remains of plants that died hundreds of millions of years ago. Coal is burned to produce energy. It is a non renewable resource, as the formation of “new” coal takes millions of years. Pennsylvania is the third largest producer of coal-used in US to generate electricity.

**Coalification** - the chemical transformation of biological matter into coal.

**Lignite** - Lowest grade coal, with high moisture content and softness (easily crumbles).

**Bituminous** - the most abundant type of coal in the US. Forms when lignite added heat and pressure. It has up to 3x the heating value of lignite. Subbituminous is a slightly less refined version, with higher moisture content and less heating value.

**Anthracite** - coal of a hard pure variety that burns with little flame and smoke. Formed under the highest temperatures and pressures.

**Surface mining** - removal of coal close to the surface of the earth (within 200 feet). Miners work to remove the overburden - the rock and soil covering the coal- then put it back in its place after the coal is harvested.

**Deep mining** - removal of coal deep below the earth's surface, usually several hundred to thousands of feet deep. Miners and machinery are
sent through dug out shafts and caves to retrieve the coal. Mine collapse is a risk associated with deep mining.

**Clean Air Act** - The United States’ air quality law to reduce and control air pollution.


**Acid Rain** - any form of precipitation that is unusually acidic due to elevated levels of sulfur and nitrogen oxides in the atmosphere.

**Methane** - (CH4) - a colorless, odorless flammable gas which is the main ingredient of natural gas.

**Photosynthesis** - the process by which plants convert sunlight into organic compounds.

**Bioethanol** - alcohol fuel made with the sugars and starches found in plants including corn and sugar cane. It is an alternative to gasoline.

**Biodiesel** - fuel made by mixing alcohol with vegetable oils, animal fats, or grease.

**Hydrokinetics** - Hydropower produced from natural bodies of water (waves, tides, and currents)

**Dam** - a constructed barrier that stops or restricts the flow of water.

**Reservoirs** - a large body of water used as a water supply. Artificial reservoirs are created by dams.

**Wind Farm** - an area of land with a group of wind turbines or windmills that produce electricity.
Additional Definitions for Middle School

BTU- British thermal unit - a measure of heat content in energy sources. One BTU = amount of heat required to raise one pound of water by one degree Fahrenheit. One BTU is roughly 1055 joules

Joule- energy expended to apply a force of one newton over a distance of one meter

kWh - the amount of energy require to light ten 100-watt light bulbs for one hour. One kWh is about 3412 BTUs or 3.6 million joules.

Nuclear Fusion - light molecules joining to produce a heavier molecule and radiant energy. This process is how the sun produces energy.

Power grid - a network of connected electrical transmission lines that deliver electricity to consumers.

Adaptation - the process of change by which an organism reacts and becomes better suited to its environment.

Transmission network - includes the power lines that link electric power generators to each other and to local electric companies

AC - alternating current - an electrical current which periodically reverses its direction and changes its magnitude.

DC - direct current - an electrical current that flows in one direction only.

Distribution Center - before delivery to a customer, electric power travels over the high voltage transmission network to a distribution substation where a transformer reduces the voltage before the electricity moves along the distribution system.
**FERC** - Federal Energy Regulatory Commission - regulates the US transmission and sale of electricity, natural gas, and oil in interstate commerce.

**OPEC** - The Organization of Petroleum Exporting Countries - enables countries who produce oil to work together in selling it.

**Power System Threat** - Anything that can damage, destroy or disrupt the power system. Can be natural, technological, or caused by humans.

**Natural Disasters** - Severe weather events that can impact energy structures or sources. Droughts, storms, etc.

**Cyberattacks** - Digital attacks on the digitized aspects of an energy network or system that can cause disruptions.

**Geopolitics** - Political relationships and issues influenced by geographical factors. Some countries may have more access to energy sources that the world depends on, and conflicts between countries can result in disruptions.