Define ***Renewable Energy***: (write here) NAME _____ Per _____ Mailbox_____

	Where does it come from?	How do we collect it and use it?	Pros	Cons
Hydroelectric Power	Flowing water from rivers and streams. Gravitational PE from flowing water as it spills down and over a causeway.	Run of River Dams (does not block entire river) Traditional dams (like the Hoover Dam, blocks the entire river) Historically dams were used as mills too. Mechanical energy to grind grain or saw logs	Abundant and free to use Reusable and the only carbon emissions really are associated w/ construction Largest current renewable source of electrical energy in the U.S. today. 10% of electricity consumption	Dams can hurt wildlife and kill fish. They block upward stream fish migrations. Initial costs are expensive 100's of 1000s of forested acres have been lost historically to dams on the West Coast of the U.S.
Geothermal	Thermal (heat) energy stored deep in the earth's core. This heat radiates upward to the crust. There we can use it to heat water which runs turbines or passively heats or cools buildings.	With a geothermal plant. Drill several 100 meters deep into the earth. Pump cool water down and hot water comes back up cyclically through pipes. This can drive a turbine which can generate electricity. More typically it can simply be used to heat office spaces.	Good reliable source of heat energy for large buildings or offices. Little to no carbon emissions associate with it. Ex: NYS DEC right here in New Paltz has a geothermal furnace. It heats their building cost effectively, no need to buy oil ever again.	Initial startup costs are high and it is not feasible yet on the small scale for residential users. No good for a single house. Not feasible everywhere, due to geological conditions.

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Solar	Solar comes from radiant or electromagnetic energy from the sun.	Solar panels Photons of light rain down on photovoltaic cells (solar panels) causing electrons to be freed from various materials (semiconductors) which can generate electricity Active solar – electricity Passive solar – heating or cooling homes & or water Ex: solar furnace for heating water	Fastest growing sector of the alternative energy market. Creates lots of jobs. Reliable Low maintenance costs Can be installed just about any, included roof tops of rural residences or cities.	The sun only shines during the day. In the Northern Hemisphere the further north you go during winter months the less and less the sun shines. There can be up to 3 months of little to no sunlight at all in the artic.
Wind	The sun drives weather patterns, which drives wind. Hot air masses rise and cool ones fall. This generates winds. Popular in the Mid-West, especially the Dakotas and here in the Appalachian Mountains.	With wind turbines Historically with wind mills Size of turbines and the wind blades determines the amount of power that can be generated.	Abundant and free to use No carbon emissions Fast growing economic sector	They are considered esthetically unpleasing by some (thought to be ugly). This can decrease property values. They cause noise pollution, are apparently rather loud. They cause bird strikes (kill lots of birds) They only work when the wind is blowing. They take up a lot of space. No good in crowded cities.

Define ***Non-Renewable Energy***: (write here) NAME _____ Per _____ Mailbox_____

	Where does it come from?	How do we collect it and use it?	Pros	Cons
Oil	The remains of long ago dead plants and animals. In particular thought to be associated with blue green algae that died and accumulated on the ocean floors over hundreds of millions of years. Buried by sediments over time they formed hydrocarbons, the basis of petroleum energy.	Drill deep into the earth's surface either off shore or on land. Build oil derricks which then pump the black liquid up and out. It is then sent to refineries to produce products like gasoline or jet fuel.	Cheap and easy to use. Easily transported with pipelines Readily available	It will run out and likely in your life time. Some experts put oil running out or becoming economically no longer profitable by 2050. It causes Global Warming or what is now known as Climatic Change There have been ecologically catastrophic events associated with it. Ex: Exon Valdez Spill 1989 or BP Gulf Spill 2010
Coal	Found in sedimentary rock Came from plants (forests) associated with swamp regions millions of years ago. The forests died, decade and piled up and up over time. Covered over with sediment they become coal (a type of rock) over millions of years.	Various mining practices Shaft mines Strip mines	Coal could power humanity for another 200-300 years at least. Can we make it clean??? Most abundant form of fossil fuel found on earth. The United States has lots of coal reserves in places like Pennsylvania. Cheap and easy to use. Readily available	Coal could power humanity for another 200-300 years at least. This will drive Climatic Change to a point of no return… It pollutes with green gases and sulfuric acid (acid rain)

	Where does it come from?	How do we collect it and use it?	Pros	Cons
Natural Gas	Traditional oil operations often have natural gas that they extract as well. It is found typically above oil layers underground. Can also be found in oil shales or shale sedimentary rock deep underground.	Collected with derricks and other fossil fuel industry practices. Hydro fracturing or better known as fracking	Natural gas burns much more cleanly and efficiently in some cases than oil or gas. Can be used for heating homes or cooking in a kitchen. Used for our Bunsen Burners in our science class.	Fracking can contaminant drinking water supplies and damage the environment. Contributes to Global Warming Strongly opposed by many in the Hudson Valley.
Nuclear Energy	On earth, nuclear fission occurs in nuclear power plants. Traditionally nuclear material like uranium or even sometimes plutonium. Could come from Thorium! Nuclear fusion takes place in the Sun and ultimately provides for all the energy in our Solar System.	Mining operatios extract uranium rich rock from the earth. This is then refined and uranium rods are produced. These are then placed in nuclear reactors – Power Plants Ex: Indian Point or naval vessels –submarines and air craft carriers.	A little amount of nuclear material produces a large amount of nuclear energy. Radiative materials are actually relatively abundant on earth. They just require a lot of energy and effort to concentrate. Nuclear energy can be clean energy Very few deaths associated with the Nuclear Industry compared with the Fossil Fuel Industry	Often located on large water bodies for coolant water, nuclear power plants are notorious for harming fisheries. A few catastrophic events have been burned into our memories giving nuclear a bad report. Fukushima, Three Mile Island, Chernobyl Nuclear is associated with nuclear arms. Spent nuclear rods from power plants could get into the hands of terrorists. Yucca Mountain – Where to store Nuclear material safely?