



e² energy “Coal and Nuclear: Problem or Solution?”

Background Essay

Energy, one of the most fundamental parts of our universe, is defined as the ability to do work. We use energy to light our cities, power our vehicles, warm our homes, and cook our food, among many other uses. There are many sources of energy, including biomass energy (energy from plants), fossil fuels (coal, oil and natural gas), hydropower energy, nuclear energy, solar energy and wind energy.

Some energy sources are renewable and some are not. Fossil fuels, like coal, oil and natural gas, are hydrocarbon deposits that were formed many hundreds of billions of years ago. Fossil fuels cannot be replaced, they are a non-renewable source of energy because once they are gone, they are gone. A renewable energy source is one that is so abundant that we will never exhaust the supply or one that can easily be replaced. Solar energy is a renewable resource because the sun provides us with an inexhaustible supply of solar energy. Biomass energy, which can be created from dead trees, sawdust or even livestock manure, is also a renewable resource because it can easily be replaced.

When fossil fuels are burned to release the chemical energy that is stored within, carbon dioxide (CO₂) as well as other gases are released into the atmosphere. Since the onset of the Industrial Revolution, the burning of fossil fuels and deforestation have caused the concentration of “greenhouse gases” in our atmosphere to significantly increase. These gases trap heat in our atmosphere, which has led to a phenomenon called global warming, a term used to describe the average rise in temperature of the Earth’s atmosphere near the surface, specifically in the troposphere. This increase in temperature can cause changes in the Earth’s climate patterns as a whole, which has effects on people’s health as well as the natural environment. Scientists have observed some of these effects already, such as rising sea levels, shrinking glaciers and changes in the range and distribution of plants and animals.

In order to reduce the emission of greenhouse gases, we need to find new ways of creating energy that don’t pollute, while also trying to update the old methods. Two such updates of old methods are coal-burning plants using Carbon Capture and Sequestration (CCS) and pebble-bed nuclear reactors. If CCS proves to be effective, coal could be burned and used for energy without emitting greenhouse gases. If pebble-bed reactors prove to be as cost effective as Andrew Kadak, Professor of the Practice, Nuclear Engineering at MIT, hopes nuclear energy could make a resurgence and be part of the solution to the energy problem.



Should coal-burning plants using CCS be part of the solution? Are pebble-bed nuclear reactors the answer? Or should we focus all of our energy on renewable resources? Learn if the experts are hopeful that the energy problem can be solved or pessimistic about our future energy needs.

To find out more about CCS visit:

www.fossil.energy.gov/programs/sequestration/capture/ or <http://sequestration.mit.edu>

To find out more about Andrew Kadak, visit www.nwtrb.gov/board/kadak.html or <http://web.mit.edu/nse/people/faculty/kadak.html>

To find out more about Pebble-bed nuclear reactors, visit <http://web.mit.edu/pebble-bed> or www.iaea.org/inisnkm/nkm/aws/htgr



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PRE-VIEWING QUESTIONS

1. What type of energy do you think pollutes the natural environment the most? The least? Why? Are there any energy sources that don't pollute the environment at all?
 2. What are the major contributors to global warming?
 3. What issues have we had with nuclear energy in the past? How is nuclear energy perceived by the public today? Why? How might that change?
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POST-VIEWING QUESTIONS

1. What is Carbon Capture Sequestration (CSS)? Could it be a solution to our current energy problems? Why?
2. What are pebble-bed nuclear reactors?
3. What are long-term goals in terms of energy production and CO₂ emissions?
4. How can the government contribute to helping solve the energy issues in the United States?