

# Adult: Points to ponder

A few observations to encourage your students to engage in discussions

## Overview

Before teaching any of these lessons, read them thoroughly to assure you understand how the activities and worksheets are integral to the overall learning process. These adult lessons are meant to be informative and engaging, with an overarching goal of encouraging students to consider the true impacts of all sources of energy. More to the point, these lessons are meant to guide participants toward being advocates for renewable energy as a viable and preferred alternative to fossil fuels based on the economic, social, and environmental benefits. You may choose to revise these lessons to address topical needs relevant to your students. Naturally, an enthusiastic teaching style will better engage your students. Be sure to print out all of the activity sheets in advance of any course. References to worksheets appear in **bold**. Narratives appear in *italic*. The lessons presented here are designed specifically for students in college. Additional lessons are available for students in grades 9-12, as well as for college students. Any of those lessons also could be taught to adult students. Plus, the auxiliary PDF files may be used to support your lessons. Please note that these lessons and activity are not accompanied with specific graphics, charts, or facts, as these are changing month by month. The percentage of oil imported into the U.S., the kilowatts of electricity generated by wind turbine, and similar statistics are not mentioned so as not to appear outdated by the time you use these courses. These PDF files include a glossary of renewable energy terms and the history and role of energy in civilization. Finally, look for Web addresses that will provide much more information in the overall cover letter.

## ***LESSON 1, 2, & 3***

All three of these lessons incorporate in class discussion. Look for the word NOTE within the lessons for additional insight on how to handle these discussions.

## **Consider making these comments as appropriate to encourage your students to think carefully about the impacts of fossil fuels and value of renewable energy**

What will be the shock to U.S. economy if a transition from fossil fuels to renewable energy is sudden and unplanned due to serious disruptions in supply? Examples of these disruptions could be war in the Middle East, a major refinery fire in the U.S., or a natural disaster such as an earthquake that affects pipelines and thus supply.

In France more than 75 percent of electricity comes from nuclear power. France has a national policy to be energy independent. Because of this, France has low-cost electricity that it exports to other European nations. It is the world's largest exporter of electricity. And, France has electrically powered passenger trains whose average start to stop speeds are in excess of 170 mph. This too is because France has developed a modern and efficient electrical infrastructure.

Nuclear power in the U.S. generates nearly 20 percent of all electricity. All of these operating plants were built before 1974. Opposition to nuclear power by some groups has been intense, effectively reducing public support for future plants. Safety concerns have been heightened due to serious nuclear disasters at Three Mile Island in the U.S. in 1979, Chernobyl in Russia in 1986, and Fukushima in Japan in 2011. Concerns have been expressed about the disposal of radioactive nuclear fuel, and of the ability of nations to use nuclear power plants to generate the material

needed to build nuclear bombs.

The U.S. alone has a vast supply of coal, especially low-sulfur content coal in Northeastern Wyoming and Southeastern Montana. Some types of coal mining cause significant environmental damage. Some forms of coal release hazardous or harmful emissions when burned. Yet coal is an affordable and reliable source of energy. It is transported to power plants within the U.S. and is exported to other nations. Coal causes relatively little environmental damage in the event of spills in transit. In some situations, power plants are built next to coal mines to greatly minimize delivery costs. Ten years ago coal fired power plants produced half of all U.S. electricity. That has dropped to 40 percent, mostly replaced by natural gas that has become much less expensive. Natural gas also has the benefit of producing lower amounts of undesirable emissions.

Coal and crude oil fuel the world. High energy content, worldwide availability, and extensive mining, refining, and delivery systems assure these fuels a dominate place across the globe. When it comes to transportation, as in planes, trains, trucks, and automobiles, petroleum products have no equal. Gas, diesel fuel and jet fuel move people and products. Farming and food production depend on crude oil. That said, crude oil makes a big mess when it spills. Offshore oil wells have exploded (BP in the Gulf of Mexico, 2010), gas pipelines have ruptured and burned in residential neighborhoods (Mounds View, Minn., 1986), huge oil tankers have broken open at sea and caused huge environmental disasters (Exxon Valdez near Alaska, 1989), and oil wells have been set afire by terrorists and as a result of war (the Persian Gulf War, Kuwait, 1991).

Gasoline as a car fuel has a built in advantage based on historical market dominance. The oil companies grew hand in hand with auto manufacturers and highway building efforts. Gas was the only choice really offered to motorists. Gas provides a lot of power for its volume and weight. It works well in the type of engines used in cars, trucks, many airplanes, small boats and lawnmowers. With some 150,000 gas stations nationwide, this fuel is incredibly convenient and completely entrenched in the American way of life.

Renewable forms of energy such as water and wind have been in use for hundreds of years. Biofuels have been around since the beginning of the automotive and aviation industries. Scaling up all of these industries to offset fossil fuels is challenging for technical reasons, and because of opposition by industries and individuals who have something to lose. And because of the Not In My Back Yard (NIMBY) attitude. If one community welcomes a wind farm, but the next one down the road objects to having the transmission lines cross the area, who wins and who loses, especially when you consider the regional impact beyond either community. Money has a way of silencing critics. Not sharing in the wealth has a way of creating critics.

Although the energy industry is extremely complex, there is overall agreement by professional that affordable and available fossil fuels will run out and that these fuels cause significant environmental damage that has been accumulating for centuries. The question is how to balance convenience against true costs. The U.S. military spends billions of dollars every year to maintain safe passage of oil tankers in and out of the Middle East. Terrorism, wars, and embargoes that cripple the world economy are directly linked to the production of oil. Mountain top mining of coal in the eastern United States has caused environmental and economic damage to communities.

Some people believe wind turbines compromise the landscape. Consider that rural areas also have power lines, larger electric transmission lines, grain elevators, water towers, processing plants and smokestacks that also “litter” the horizon. We tend to be blind to what we grew up with but sharply focus on what represents something new. Naysayers are common in our society. It is easy for people to be critical of anything, far more difficult for them to offer viable alternatives or solutions. People will take sides on an issue without necessarily giving consideration to the opposite point of view, or listening with an open mind to professionals who are well versed on technical matters. You have both a right and responsibility to research these topics, ask tough questions of the people and companies and agencies involved, and to have a voice in your energy future.

–College Sources: U.S. Energy Information Administration, U.S. Department of Energy, U.S. Department of the Interior, Bureau of Reclamation, American Wind Energy Association, Growth Energy, Illinois Department of Natural Resources, The Center for Green Schools, U.S. Green Building Council, LEED Certification, National Renewable Energy Laboratory, Midwest Renewable Energy Association, Center for Rural Affairs, National Energy Education Development Project, the PEW Environmental Group.

