Common Concerns About Using Wood for Energy

by Terry Conners

Sometimes it seems as though fuel costs for transportation and heating/cooling will never stop climbing, and it's only logical to look around for more efficient cars, furnaces, air conditioners, and water heaters. These measures will save us all money in the short term, but is there a way to achieve lower energy costs by taking greater advantage of home-grown fuels like coal or wood? Coal is a well-known, relatively inexpensive energy source for Kentuckians, but expansion of coal use has been criticized by some because of concerns about the environment and global warming. Does wood have the potential to supply energy for Kentuckians? Does using wood for fuel have a downside? This article addresses some of the questions from people all around the commonwealth.

Question 1:

How does wood fuel compare to coal and natural gas in terms of environmental impact and price?

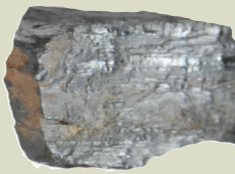
Environmental considerations are different for coal, natural gas, and wood. Coal-fired power plants require air pollution control devices to keep sulfur dioxide and mercury compounds out of the air. In contrast, natural gas and wood emit negligible amounts of sulfur dioxide and mercury when they are burned, and they tend to produce smaller amounts of nitrogen oxides and carbon monoxides than coal. Ash from burned wood contains minute amounts of metals from the soils in which the trees were grown, but studies have shown that ash disposal does not present any environmental problems or concerns about uptake of metals in vegetation.

The cost of fuel wood depends on the local market demand for pulp wood and manufacturing by-products, as well as harvesting and transportation costs. Generally, however, wood compares favorably on an energy unit per dollar basis. Based on regional market prices available as this article is written (June 2008) and nominal boiler efficiencies, fuel costs exclusive of delivery are approximately as follows:

- Wood fuel, roundwood (not split, chipped, dried, or made into pellets)—$3 per million BTUs at 68 percent boiler efficiency;
- Natural gas—$13.35 (based on the commercial rate) per million BTUs at an efficiency of 85 percent;
- Appalachian coal—$5.20 per million BTUs at 85 percent boiler efficiency.

Obviously there will be additional processing costs associated with chipping or grinding wood into a form that can be used for fuel, but wood appears to be competitively priced and may be more economical than customary fuel sources in Kentucky.

Many people in Kentucky want to see us continue to use coal for power, and there are political and economic pressures for us to expand coal's use and even to turn local coal into liquid fuels. However, because of Kentucky's coal heritage and the coal-handling infrastructure that already exists, wood is not likely to replace coal based on economic reasons alone at the present time. If coal prices continue to escalate compared to wood prices, this situation might be more open to change.



Question 2:

Doesn't burning wood put carbon dioxide into the air the same as other fuels?

Wood, coal, and natural gas are all made of carbon-based compounds, and burning any of them releases carbon dioxide into the atmosphere. The difference between burning coal, natural gas, or trees, however, is that when trees sprout or are replanted after harvesting operations, each new tree will absorb the same amount of carbon during its lifetime as the tree it replaced; there is no net increase in the amount of carbon in the atmosphere when wood or other biomass is burned. Whether wood decomposes naturally or burns, it releases the same amount of carbon. Burning coal or natural gas, however, releases fossilized carbon that has been out of the earth's ecosystem for millions of years. This "old" carbon, when added to the atmosphere, is thought to be responsible for a changing global climate.

Question 3:

Will a wood energy power plant produce a lot of air pollution?

Burning wood in uncontrolled conditions can release minute particles into the air, causing a haze and respiratory irritations. This has happened in the past during times when energy prices rose quickly and before residential wood stoves were constructed to minimize these sorts of problems. Unlike burning wood in a fireplace or uncontrolled wood stove, however, modern wood-burning power plants control the combustion temperature, the moisture level, and the size of the wood particles, all of which reduce air pollutants. In addition, air emission controls capture and filter combustion gases and particulate air pollutants. These processes greatly reduce the amount of pollution produced by commercial wood-burning facilities.

Question 4:

If we use wood for electricity, will we consume all our forests?

Unlike fossil fuels, wood is a renewable resource. With proper management, local forests can readily produce enough wood to replace 10 percent of the fuel required by a coal-fired power facility. More wood could actually be made available in some locations (particularly if intensively managed "energy farms" are planted with trees), but a goal of replacing 10 percent of the coal used in Kentucky power plants is a practicable objective for some companies. With the exception of equipment to make wood fuel a uniform and suitable size, replacing this relatively small amount of coal fuel with wood does not require major modifications of the power-generating plants, and at the same time, it reduces the amounts of nitrogen and sulfur compounds emitted by coal-fired generators. This helps keep the cost of EPA-required pollution control equipment down and maintains a low cost of energy for Kentuckians. Using wood for energy may actually help maintain forests by increasing their economic value.

Wood pellets are an easy way to handle wood fuel in the home.
Photo courtesy: Sarah Ashton, www.southernbioenergy.net

Question 5:

If we use wood for fuel, will we deplete the forest of all its nutrients?

It is possible to reduce soil nutrients over time through intensive agriculture if nutrients are removed faster than they are replaced. However, most of a tree's nutrients are contained in the leaves, not the wood. The removal of wood from a forest removes only about 4 percent of the nutrients that a crop of corn would, and it only happens once every 75 years or so (not every year as for corn), depending on how often timber is cut. Nutrient depletion is not normally going to be a problem.

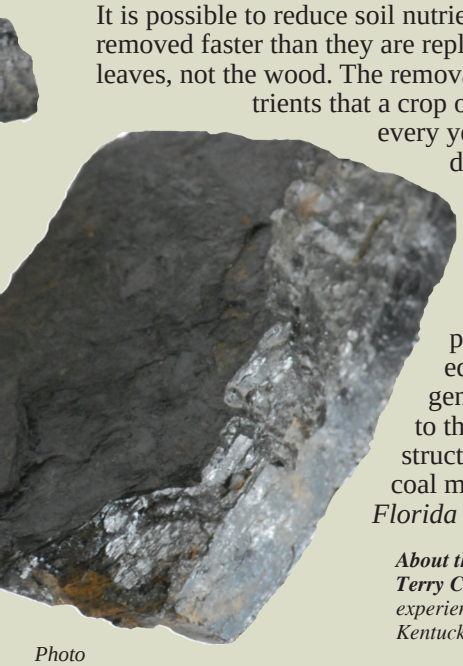


Photo courtesy: Terry Conners

Summary

Wood has the potential to replace some of the fuel in coal-fired power-generating facilities. It is economical and low in pollutants, and it does not contribute to environmental concerns about carbon additions to the atmosphere. The inclusion of wood as part of a coal-fired power plant would actually help to reduce air pollutants and the cost of air pollution control equipment. However, even though wood could be an economical alternative to coal for power-generating facilities in Kentucky, it is unlikely that it will replace coal in large percentages due to the culturally and economically embedded supply chain and the existing coal-handling infrastructure. If coal prices continue to rise compared to wood prices, the substitution of wood for coal might become more flexible. *(Thanks to Martha C. Monroe and Richard Plate, University of Florida for their contributions to this article.)*

About the Author:
Terry Conners, Ph.D. *is an associate extension professor at the University of Kentucky Department of Forestry and has experience working with the pulp, paper, and wood industries as well as youth education. Current interests include assisting the Kentucky forest industry, youth education, and assisting homeowners with wood identification and wood related problems.*

Cooperative Extension Service, Department of Forestry, University of Kentucky, 202 Thomas Poe Cooper Building, Lexington, KY 40526; E-mail:tconners@uky.edu; Phone: 859.257.2463; Fax: 859.323.1031.

Photo courtesy: Terry Conners

A monument honoring coal stands in Baxter, KY. Maybe someday there will be one for trees!

Above photo: Burning coal releases fossilized carbon that has been out of the earth's ecosystem for millions of years. This "old" carbon, when added to the atmosphere, is thought to be responsible for changing global climates.