WOOD to ENERGY

Case Study

Wood and Paper Trim the Energy Bill

Lindsey McConnell & Martha C. Monroe

Nestled in the rolling hills and farmland of northwest Missouri is Maryville, a small college town that is home to two large corporations, Kawasaki and Energizer. This community of 11,000 residents is blessed with an abundance of natural resources, including the 1,000-acre Mozingo Lake—stocked with fish that beckon anglers and boaters—and a beautiful park that attracts campers and other visitors.

Maryville is also home to Northwest Missouri State University, which serves an estimated 6,500 students (Figure 1). More than seventy species of trees thrive on the 350-acre main campus, which is the official Missouri State Arboretum. The university has its own thermal energy plant, supervised by James Teaney, a self-proclaimed jack-of-all-trades who became the wood-fueled facility's supervisor twelve years ago. Explaining how he enjoys his job, Teaney says, "This is a job you have to want." Because the wood and paper boilers, as well as three natural gas lines, require constant management and adjustment to accommodate available fuel and weather, Teaney is routinely on call to ensure the twenty-four-hour operation runs smoothly.

The idea of using wood for energy emerged during the 1970s energy crisis, when one winter temperatures dropped below zero degrees Fahrenheit (°F) and the university's natural gas supply was suspended. Anticipating a rise in energy prices, the university began searching for alternate fuel sources. In 1978, a newly formed Energy Committee established criteria for choosing a new source of energy: it must be readily available, clean burning, renewable, and easily stored; its use must lead to conservation of traditional fuels; and it must be suitable for an aesthetically pleasing on-campus thermal energy facility. Wood chips, a by-product of the local forest products industry, met all six criteria.

University studies suggested the estimated 100,000 to 150,000 tons of wood waste available from communities along the Missouri River was enough to make a small wood-fueled facility feasible. A variety of grants and a privately funded $2 million lease allowed the university to move forward with its plan to use woody biomass for thermal energy.

The facility combusts wood in a Zurn watertube boiler with an inclined grate. Boiler temperature reaches 1,500 °F and produces up to 30,000 pounds of steam per hour at 80 pounds per square inch (psi). According to

Figure 1. *Northwest Missouri State University has a student population of more than 6,500.* Photo courtesy of Creative Commons Attribution Share Alike 2.5.

manager Teaney, "We can burn one semi (truck) load every eight hours when we are burning hard."

Contracts for wood are established with suppliers at the beginning of each fiscal year. The university owns four trucks, which transport the wood fuel from local sawmills. Emphasizing the need for clean wood, Teaney refers to his drivers as the "first line of quality control." He says they reserve the right to refuse to pick up a pile if it doesn't meet quality control standards. Suppliers may deliver their wood to the plant, but loads still must meet strict standards. All chips must be smaller than two and one-half inches long and screened for dirt. The university upholds a "one strike" policy, whereby suppliers who fail to meet standards more than once may have their contracts canceled.

Up to 3,000 tons of wood chips can be stored on-site in an outdoor pile. Wood is not dried prior to use but is tested for moisture content, since combusting wood with more than 45 percent moisture is inefficient. Deliveries of cottonwood are least likely to meet this standard, and suppliers are not paid the full rate for wood that is too moist.

The facility uses a wet scrubber to remove air contaminants and ash is collected and used throughout the campus for soil enrichment. Previously, ash was used as a daily cover at a nearby landfill, until the landfill closed. Teaney sees ash disposal as a potential problem in the future but hopes that new markets for ash will be developed, for example, as a component in garage flooring.

Northwest Missouri State University is an example of a wood-to-energy operation that adapts to change and continues to improve. For instance, when the facility experienced supply shortages several years ago, it expanded its hauling radius to 250 miles. In some cases, change has brought new opportunities. The Missouri Senate passed a bill in 1990 calling for an annual 40 percent reduction in the overall amount of waste accepted at state landfills. A pilot study found that discarded newspapers, magazines, and cardboard could be burned to produce energy at the campus biomass plant. Grants from the Missouri Department of Natural Resources, Division of Energy and Division of Environmental Quality, as well as an interest-free loan from the U.S. Rural Electrification Administration, enabled the university to retrofit a boiler and construct a pelletizing station, which compresses waste paper into uniform pellets.

The Northwest Regional Council of Governments launched an educational program encouraging residents to separate recyclables from their trash, and worked with local collectors and the city to deliver the clean paper waste to Northwest Missouri State University. Because the wood-fueled facility was able to help the community achieve waste reduction goals, the university received the 4th Annual Governor's Pollution Prevention Award in 1997.

Northwest Missouri State University calculates it has saved an average of $375,000 per year for the past twenty years by using wood to produce energy. Perhaps just as important, biomass fuels provide a locally controlled, secure fuel supply. Wood currently provides 65 percent of the thermal energy needed to heat 1.7 million square feet of building space, and also provides some cooling. The university is experimenting with utilizing livestock waste and switchgrass but plans to rely on wood until other fuels become less costly.

For more information regarding specific concerns about wood-to-energy facilities, refer to the other fact sheets, case studies, and community economic profiles available in this series at http://www.interfacesouth.org/woodybiomass. Additional information is available at http://www.forestbioenergy.net.

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