WOOD to ENERGY

Case Study

Power to the People

Sam Negaran, Richard Plate, Rob Brinkman, & Martha C. Monroe

Rising energy demands and a growing demand for reliable sources of energy are on the minds of many people these days. Two and a half decades ago, the residents of Burlington, Vermont, were faced with energy issues similar to those confronting many communities today. With oil and natural gas prices at all-time highs, residents in the Northeast were uneasy about the prospect of facing long, cold winters. Upset about high energy prices and fossil fuel emissions, they began to investigate alternative sources of power. They also made it clear that not just any new power station would do. The new station would have to be reliable, cost effective, nonpolluting, and acceptable to the public. Their search for solutions that would meet all of these conditions led the citizens of Burlington to woody biomass.

For years, the pulp and paper industry used bark and wood chips efficiently to generate power and created good environmental controls for air and water emissions. The use of wood as a fuel source had the potential to provide many environmental and economic benefits to the community. It would stimulate the local economy by providing jobs and would revitalize the health of the state's forests. But despite these potential advantages, some Burlington residents were uneasy about siting a large, industrial power-generating facility in close proximity to residential neighborhoods. Chief among their concerns was the rumble of three or more truckloads of wood per hour through suburban streets for delivery to the station. So the Burlington Electric Department (BED) agreed to receive 75 percent of all wood fuel deliveries by rail from a remote loading yard thirty-five miles away, even though it would mean a 20 percent increase in transportation costs.

Local residents also were concerned that the increased demand for 500,000 tons of wood per year might devastate nearby forests. Addressing forest management concerns, BED and the State of Vermont jointly developed strict guidelines for wood harvesting that require a staff of four professional foresters to manage wood fuel procurement. Each harvest site and plan requires review by a forester and the state government to ensure the impacts on land and wildlife are minimized and to maximize the potential for forest regeneration. Clearcutting is limited to 25-acre parcels and is allowed only in stands of low-quality trees.

In 1978, 73 percent of Burlington voters approved financing for construction of the McNeil Generating Station, and on June 1, 1984, the McNeil Generating Station went into operation. With plant operations fully underway, other challenges surfaced. Nearby residents complained about excessive noise from plant activity and vibration from unloading railcars. They also blamed the plant for dust in their neighborhood, so an enclosure for the rail unloading facility was built, designed to resemble a historic covered bridge. When the dust remained a concern, studies revealed that the plant was not the source after all, and that increased development activities and road dust from other areas of Burlington were the culprits.

In the beginning, wood chip storage was also a challenge. Massive piles of wood chips fermented, producing an unpleasant smell, and occasionally spontaneously combusting. To address these problems, a strict regimen for on-site chip handling was implemented. Long, low piles of wood chips are used to ensure they do not produce odors or smolder (Figure 1). Equipment modifications and new operating procedures reduced plant noise. By 1988, all outstanding complaints about the McNeil Generating Station had been addressed.

In 1989, the station was retrofitted to include burning natural gas. This allowed the McNeil station to generate more power and take advantage of more cost-effective fuels as wood prices rose. Since that time, however, wood has remained the predominant fuel due to its lower cost.

In 1996, McNeil participated in an experimental wood gasification unit funded by the U.S. Department of Energy (DOE). By using a local renewable wood resource this facility has infused an estimated $200 million into

the local economy, rather than sending money out of the region to purchase other energy sources.

Today, 70 percent of the wood chips used by McNeil are from low-quality trees and residue from forestry operations. An additional 25 percent comes from sawmill waste products such as bark and sawdust; the remaining 5 percent comes from clean, urban wood waste. An on-site trial plantation of willow and poplar trees is currently being studied as a potential future source of wood fuel.

Figure 1. *Wood chips are stored in long, low piles to prevent fermentation.* Photo courtesy of McNeil Generating Station.

The McNeil Station is equipped with a series of air-quality control devices that limit the particulate stack emissions to one-tenth (.1) the level allowed by Vermont state regulations. McNeil's emissions are one one-hundredth (.01) of the allowable federal level at the time the plant was built. The only visible emission from the plant is water vapor during the cooler months of the year. Water discharged from the McNeil Station is monitored for pH, temperature, flow, and heavy metals. It is treated to maintain a balanced pH, allowed to cool to a temperature that will not adversely affect aquatic life, and then is pumped to the Winooski River. The wastewater quality is required to be equal to or better than that of drinking water for most parameters before being discharged to the river. Local contractors collect residual ash from the station and mix it with agricultural grade limestone. The mixture is used as a base for new road beds and as a conditioner for acidic soils.

Today, two-thirds of the electricity consumed by citizens of Burlington comes from wood and other renewable resources. While the McNeil Generating Station has encountered challenges due to its proximity to residential neighborhoods, it has been sensitive to the public's concerns and has worked to address them. The station also provides the community with a number of benefits. It employs approximately thirty-eight staff at any given time, provides useful disposal of wood waste, and offers the potential for linking the plant's steam output to a district heating system. Use of the steam for heating would make this a combined heat and power (CHP) plant and greatly increase the plant's overall efficiency.

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.

Authors

Sam Negaran, Outreach Assistant and Richard Plate, Outreach Research Associate, School of Forest Resources and Conservation, University of Florida, Gainesville, FL; Rob Brinkman, consultant, Gainesville, FL; and Martha C. Monroe, Associate Professor, School of Forest Resources and Conservation, University of Florida, Gainesville, FL.

Reviewers

John Irving, Plant Manager, McNeil Generating Station, Burlington, VT, and Phillip Badger, Bioenergy Technical Director, Southern States Energy Board, Florence, AL.

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