

## BIOMASS

CASE STUDIES SERIES

CROTCHED MOUNTAIN REHABILITATION CENTER, GREENFIELD, NEW HAMPSHIRE

# At Crotched Mountain, a New Woodchip System Generates Cost Savings and Fuel Security

## Woodchip District Heating System

**Heating Capacity (output): One 1.2 MW (4 MMBtu/hr) boiler and one 2.3 MW (8 MMBtu/hr) boiler**

**Emissions Reduction and Combustion Control Equipment: Baghouse, cyclone**

**Year Installed: 2007**

**Thermal Output: Hot water**

In the forested hills of southern New Hampshire, the nonprofit organization Crotched Mountain Rehabilitation Center has worked since 1936 with disabled and brain-injured adults and children and their families, building hope and rebuilding lives. Several years ago, the sizable campus's aged, expensive, oil-fired heating system was close to the end of its life.

As Donald Shumway, Crotched Mountain's president, pondered what to do, he was driving to work each day past forests and lumber yards, then up the tree-lined mountain road.

"Our president is kind of a visionary guy—so he started thinking about wood," says Michael Redmond, Crotched Mountain's vice president for advancement and acting chief financial officer.

Could, Shumway wondered, a wood-fueled district system heat and cool 400,000 square feet of building area, including a central facility, a children's hospital, and a small school? Could woodchips be the optimum fuel choice? What assumptions could be made about price and supply? In how many years might fuel-cost savings from such a system repay its initial costs?

With funding support from several foundations, Crotched Mountain contracted with Biomass Energy Resource Center to produce a series of linked feasibility studies. In late 2005, the four completed reports assessed fuel supply, project economics, site planning, performance specifications, and implementation issues.

"The studies said 'Go, go, go,'" Redmond recalled. "That led us to the solution."

The winter of 2007-08 saw the first full-time use of that solution: a custom-designed woodchip plant where computer controls select and run parallel boilers—a four MMBtu/hour beside an eight MMBtu/hour unit—for maximum efficiency. Through the winter, the system met 100 percent of the campus's heating needs. Burning green hardwood chips at a price equivalent to \$.61 per gallon for fuel oil, it generated cost savings of about \$250,000.



## Clean Emissions Don't Require State Testing

Crotched Mountain's twin chip boilers are fed by parallel conveyors that automatically unload two parallel storage bins, with a 150-ton combined capacity. At the base of each bin, an auger runs on a track to draw chips evenly from storage down onto the belts below. A truck bridge between the two storage bins allows trucks to back up and unload on both sides.

"We installed a very effective two-stage emissions-control system, consisting of a baghouse with a cyclone separator that reduces stack emissions to an extremely low level," says Ray Sebold, the project manager. The cyclone unit uses centrifugal force to pull out larger particulate matter, and the baghouse then separates fine particulates. As a result, what gets released into the air is mostly water vapor. *over*

"With these emissions controls in place, the Department of Environmental Services does not require our plant to undergo monthly tests—which also saves on costs," Shumway says. Hot water from the system is now meeting virtually all the campus's heating and cooling needs.

"In time, as the technology develops, we might be able to use woodchips to generate electricity as well," adds Sebold.

*over*

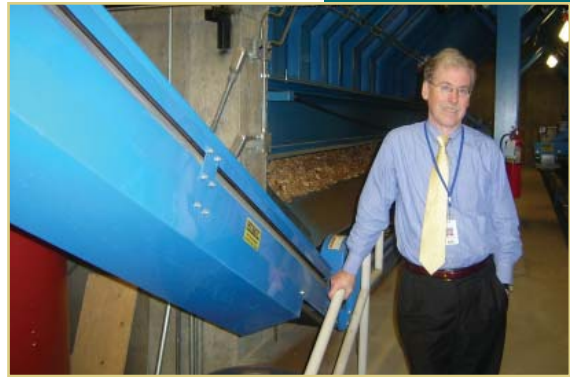


**BERC**

Renewable • Reliable • Resourceful

**Biomass Energy  
Resource Center**

**Pictured on front: The woodchip plant at Crotched Mountain Rehabilitation Center. Right: Michael Redmond, vice president for advancement and acting chief financial officer, stands alongside Crotched Mountain's woodchip heating and fuel delivery system.**



With a present-day staff of about 700, Crotched Mountain envisions expanding its campus in the years ahead. The new system has the capacity to meet those needs, as does the two-mile buried piping loop that was installed along with it to connect most of the buildings to the wood boilers.

### **'You Don't Really Worry'**

"We made our 'go' decision when oil was \$1.80 a gallon," notes Redmond. "This winter, it was over \$3." BEREC originally estimated that fuel-cost savings would pay for the project within seven years; rising oil prices have since lowered that estimate to five years.

"The biomass wood resource from woodchips can be sustained indefinitely, it's a healthier alternative fuel overall for people and the planet, and historically cost increases have been much more modest" than for fossil fuels, Shumway notes.

Crotched Mountain has contracted with a woodchip supplier 10 miles away and calls for chips that are matchbook sized or smaller, with consistent quality and moisture content.

The supply contract runs for five years, and has a two percent price escalator.

"So we know what our fuel costs are going to be for the next five years," Redmond notes. "Nobody who's using oil has any idea what their fuel costs are going to be."

"We're thrilled that we are purchasing our fuel supply from a local company," says Shumway. "And we would much prefer to be supporting the New Hampshire forest economy, which remains very important to the state, than sending our money overseas."

Alongside the two chip boilers, Crotched Mountain's compact new central heating plant building has a smaller, oil-fired backup unit. During the 07-08 winter, that unit never had to be operated at all.

On a wall by the chip boilers, computer control boxes report on operations and will alert the staff if the system needs their attention. Nearby is an ordinary-looking thermostat. It reports that water is leaving the furnace at 206°, and returning at 199°.

"That's how efficient this system is," Redmond observes.

Ash must be removed each day, and by the door stand several ash-filled galvanized-metal trash cans. Crotched Mountain operates a small dairy and egg farm, and the farmer in charge will pick up the cans, and mix the ash with organic fertilizer. Otherwise, Redmond says, the system operates its own controls so smoothly that it does not require a full-time, on-site supervisor.

"It's kind of like the furnace in your basement," he adds. "You don't really worry about it."

For more information on this and other biomass energy projects, contact:

Biomass Energy Resource Center  
PO Box 1611, Montpelier, VT 05601  
ph 802-223-7770 | fax 802-223-7772  
info@biomasscenter.org  
www.biomasscenter.org