In the Black Hills region of South Dakota, “logging leaves piles of slash”—the noncommercial parts of harvested trees—“that sawmills cannot use,” notes a recent presentation by a state correctional center that in 2008 became the state’s first public facility to fire up a biomass heating system.

“Using the assumption that 50 percent of the sawmill residues [are] available and 30 percent of the harvesting slash could be recovered and chipped,” the presentation continues, “the region would have 155,000 green tons of chips for use as fuel. Enough to heat 90 facilities identical to STAR Academy.”

STAR stands for State Treatment and Rehabilitation Academy. Near Custer, it’s the South Dakota correctional center for juvenile boys. The facility’s pioneering of biomass energy use in the state actually began with South Dakota’s governor.

Several years ago, Governor Mike Rounds attended a conference of the Western Governors Association that included discussions and information about using renewable energy, including biomass. Intrigued, he asked the South Dakota Division of Resource Conservation and Forestry to look into prospective uses in state operations. The division contacted the Biomass Energy Resource Center in Vermont, and offered to provide a feasibility study for any state facility that was interested in biomass heat.

One who responded was Robert Etzkorn, physical plant manager at the STAR Academy. Etzkorn was looking after a facility that dated to the early 1900s, and had previously been a tuberculosis treatment center and then a developmental center for the physically and mentally disabled. In 1995, the state turned the physical plant over to the Department of Corrections.

“Converting an old developmental center into a boys’ facility has certain challenges,” Bob Etzkorn says. One was the STAR Academy’s two aged fossil-fuel boilers. One burned No. 2 fuel oil, the other fuel oil or propane. Both were more than a quarter-century old.

Etzkorn filled out the paperwork to get a biomass feasibility study. “Everybody in Corrections pretty much looked at me like, ‘Whatever,’ until we got the feasibility study back and the numbers were quite good.”

The system’s projected costs, and the projected payback of those costs through fuel savings, looked encouraging. “So we sent the feasibility study up the line to the governor’s office,” Etzkorn says. “The governor said, ‘How come we’re not doing this and saving money?’”

A followup study by Rapid City engineer John Hey projected somewhat higher costs—$2.1 million—and a longer payback period, but the project went ahead. The state Energy Management Office provided a loan to cover the projected costs. When the project ran over budget, to $2.6 million, the Department of Corrections covered the overrun.
“It was kind of a tough process,” Etzkorn says of the quest for funding. “But in the year that we’ve run it, we have made two loan payments—and we’ve more than made back those loan payments, plus a little extra,” in fuel-cost savings generated by the biomass system.

**Several Months of ‘Messing with It’**

According to Etzkorn, the biomass system’s initial winter wasn’t easy. At all.

“When we first started the system, in February [2008], it was kind of a nightmare—very demanding and time-consuming,” Etzkorn says. The contractor that installed the system assigned an employee to provide training to the STAR staff—“but the gentleman who did that training was their computer guy,” Etzkorn says. “He didn’t know much about the actual operation of the system; he knew the computer [control] system, so he focused on that.”

Meanwhile, the system’s “operating parameters were really not set up correctly.” Finding the right settings, Etzkorn says, “was really a trial and error process.”

The fuel delivery system didn’t work well until the STAR staff improvised a fix. “It’s an auger system that just runs on the concrete floor of the chip bin,” Etzkorn explains. The augers “would go up against the fuel and they would get stuck—they wouldn’t pull any fuel out.” The staff solved that by welding teeth onto the auger. The contractor had to return to correct a related problem—an incline fuel-feed auger had been built on too steep an angle.

“There were a good three or four months when we were messing with it,” Etzkorn says. The contractor should have been onsite, making the adjustments; but it was based out of the area, and “that’s not realistic,” Etzkorn says. Etzkorn credits the project engineer, John Hey of Rapid City, for staying with the system and helping to make it work.

“He was excellent,” Etzkorn says.

**‘The Potential Is There’**

The STAR Academy’s woodchip system uses chips from logging, sawmill, and postmill operations, provided by a contractor that has “been very good to work with—they’ve helped us work out some issues,” Etzkorn says. “The postmill chips for a while were kind of dirty. The contractor has worked with his people, and they’ve cleaned that up quite a bit.”

The ash-removal system created problems, too. It’s a wet-ash, as opposed to a hot-ash, system, and its drag-chain system was often clogging. One of the ash augers has broken three times; after the third break, a local welder did a repair that has held up.

All this hassle—yet another struggle involved adjusting the system’s fans to optimize air flow for clean combustion—has taken its toll. In those first months, Etzkorn’s wife threatened to set up a cot for him at the heating plant. The manufacturer continues to work with him to iron out some problems that persist.

Yet even after all of that, he’s optimistic. “We’re being very persistent, and the manufacturer usually comes around,” Etzkorn says. “They’re implementing things that we’ve discovered into their new systems. They’ve got a good product—they just need to make it better. The potential is there.”

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