In the world of community-scale biomass heat energy, the Canadian maritime province of Prince Edward Island has been a pioneer, with a woodchip-fueled district energy system heating much of downtown Charlottetown, the provincial capital, since the late 1980s. But that’s not the oldest biomass system in the province: 44 kilometers (27 miles) east of Charlottetown, in the small town of Montague, the Kings County Memorial Hospital has been heating with woodchips since 1982.

What’s more, the hospital’s original biomass system is still in operation.

“We heat the hospital and the seniors’ home next door,” about 4,200 square meters (46,000 square feet) in all, says Leo Killorn, the hospital’s chief engineer. “Our woodchip boiler is about 150 horsepower, and we have two oil backups, about 125 HP each.”

Kings County Memorial serves a rural county of 20,000 people, with 2,000-population Montague its market center. The hospital’s vintage Swede Stoker system can produce just under 110 kW (380,000 Btu/hour), and burns about 1,600 tonnes (1,800 US tons) of whole-tree chips each year, at a price of about $49.50 CAD per tonne. The hospital uses about 45,000 liters (11,700 gallons) of No. 2 fuel oil annually in its backup boilers, which run mostly during the warmer seasons when wood heat is less efficient.

The chip boiler “heats both buildings, no problem—hot water as well,” Killorn says. The boiler produces steam that is converted in a heat exchanger into hot water. The heat produced by the biomass system is also used to produce a separate supply of steam that the hospital puts through a heat exchanger to produce its own steam for sterilization, heat, and hot water.

For fuel, Kings County uses “mostly spruce and poplar, now,” says Killorn. “We don’t burn hardwood; that’s better off going in the woodstoves.” It uses a local contractor, and supply is not a problem.

“A lot of the sawmills closed up here, so there’s a lot of woodsmen not doing so much,” Killorn says. “If we put that contract in the paper, there’d be a lot of people wanting to do the business—because it’s a living for somebody.”

Challenges in Fuel Quality
The challenges for the hospital are not in obtaining woodchips—they’re in the quality of the supply.

“If you have good, perfect chips, you wouldn’t have a problem,” Killorn says. “You’ve got to stay on top of your supplier all the time.”

The issues that do come up are two-fold: moisture and chip size.

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“We like them around 40 percent moisture content,” Killorn explains. “We do a moisture content [test] every time we get a load of chips.” The test consists of heaping a dinner plate with chips, weighing it, drying the plate load for two minutes in a microwave oven, then weighing it again.

“They have the formula for figuring out moisture content,” Killorn says of his system operators.

“Forty-five percent is optimum. If the delivery fellow comes in over 45 percent, then he starts to get money taken off. It’s coming right out of the woods, so it’s impossible not to have moisture. Anywhere between 30 and 45 percent is great.” Based on a formula the hospital uses, Killorn’s staff figures out the average moisture content in each month’s supply, and subtracts from the payment for any percentage over 45.

The other concern is with chip size. The hospital’s contract with its wood supplier says delivered chips must be able to pass through a 6-centimeter (2.5-inch) screen—“that means no sticks, right?” Killorn points out—and must be free of contaminants such as metal, glass, stones, and soil. Chips must also be free of excess snow, ice, and chunks of frozen fuel material.

The supply doesn’t always meet those standards. And when it doesn’t, trouble can show up in the fuel feed system. Four “drags,” like large bars, pull chips along the floor of the 230 cubic meter (8,000 cubic foot) storage bin, feeding them to the first of three successive feed augers. If a stick in the fuel feed gets lodged against one of the paddles on the first feed auger and stays there, that can cause the whole supply system to shut down.

“I try to be on top of this all the time,” Killorn says. “You could throw a couple of logs in a woodstove and walk away—but there’s a lot of moving parts in this thing.”

Because the fuel supplier works with various wooded properties that need to be cleared, the supply is not always consistent. “It’s always a struggle with your supplier, if you have a system like this,” Killorn notes. In future supply contracts, he’d like to have a provision that sets a penalty, to be taken out of payments to the supplier, when the chip system has to be shut down because of chip-quality problems and the oil backup is used.

“We’re still saving money, don’t get me wrong! And the machine works great,” Killorn concludes. “In 27 years, we’ve done the refractory over once, and we did the feed augers over once. This was the first wood boiler to go in on Prince Edward Island, and it’s still running.”