The handsome sanctuary of the All Souls Interfaith Gathering, an ecumenical worship and meditation center in Shelburne, Vermont, is surrounded by gently rolling fields and woods that slope to the shore of nearby Lake Champlain. If a current experiment goes well, those fields may soon supply fuel for the biomass hot-water boiler that heats the sanctuary—and that could help to open up new vistas for locally produced biomass fuel.

All Souls installed a 145 kW thermal (500,000 Btu/hour) pellet boiler, produced by Solagen of Oregon, in 2007. The simple, high-temperature system has been burning 34-40 tons of wood pellets each Vermont heating season to heat the 14,000-square-foot sanctuary.

“It burns very cleanly,” says project supervisor Christopher Davis of the pellet boiler. “The idea here was for something that was efficient and that could use renewable fuel—preferably something we could grow locally, like right on the site.”

Davis managed the project that rebuilt and expanded a former residence into the All Souls Sanctuary (www.allsoulsinterfaith.org), remaking its one-time garage into a heating plant downstairs and a program space above. Davis also manages the Meach Cove Trust, which runs a scenic former 19th-century estate, a 1,000-acre property, that surrounds All Souls.

In the summer of 2009, Meach Cove’s fields hosted the experiment that grew various grasses to test their potential as alternative sources of pellet fuel.

“All Souls researches pellet burners and settled on the Solagen unit, which is designed to burn fuel at very high temperatures and “allows us to burn any type of combustible fuel that fits into its four-inch opening,” Davis says.
The pellet boiler has two adjoining chambers. First is a stoker, with air holes through which fans force air while an auger pushes in fuel pellets. Ignition in the stoker creates a very hot fire that is blown into the second chamber, the firebox. In high-fire mode, the boiler runs at 900-1,200 degrees Fahrenheit, with a surrounding water jacket regulating the temperature.

“There are no moving parts in there,” Davis says, shining a light into the burn chamber, now cooled down for the summer. “It’s just a concrete cave, with a smooth bottom.”

As new fuel moves into the stoker, it pushes ash to the base of the firebox, where another auger draws it out. An induced draft fan pulls the heated air up and into the triple-pass boiler, or heat exchanger, where it heats water to 170-180 degrees.

“What we have learned is that the boiler knows two things,” Davis says. “It maintains a temperature to supply hot water to the building: It gets called to produce more hot water, and it does that very efficiently. When that is satisfied, it goes from high-fire mode into standby mode.”

The system runs at high-fire just about 25 percent of the time, burning about 58 pounds of pellets per hour and filling a 30-gallon ash barrel about every five days.

“We haven’t burned [alternative fuels] in large quantities yet,” Davis concludes. “This is our second season. What we know is that we’ve worked out the operating issues, and made the adjustments for air and fuel-feed rates. Now we have a clean-burning system that is saving us, [compared to] $2.50-per-gallon number-two fuel oil, about 20 percent.

“Last year, when oil went to $4, that would have paid for this boiler in less than two seasons.”

Will this little boiler be part of opening up new fields of fuel-cost savings for the future? The answer to that question will start to become clearer after this year’s grass harvest is all in.