Out back of a small secondary school that serves a very rural district, in the West Kootenay Mountains of British Columbia, is a big, windowless metal box with solar panels on top. When you look closer, the box turns out to be three shipping containers bolted together, with a sign on the side that says, “Renewable Energy Heating System.” This is the Nakusp Energy Corporation’s (NEC’s) combined wood and solar heating plant. Serving the Nakusp Secondary School, this system has been a focus of much more attention than its modest appearance and heating capacity would suggest.

The players in developing the project have been NEC, the Arrow Lakes School District 10, and Natural Resources Canada. NEC was formed in 2004 as a locally owned, private energy supply company that could offer significant cost savings to the school district by installing a system that would both burn wood and meet the province’s air emissions standards.

NEC put its project out to bid in 2006 and selected Energy Cabin, one of four bidders. Energy Cabin is an Austrian company that specializes in “modular and mobile heating and cooling systems based on renewable biomass and solar energy sources,” according to its website. Energy Cabin brought with it some of the project financing, from the European Union through the Austrian Export bank.

The Energy Cabin equipment, mostly pre-assembled in the containers, arrived in January 2007—and then the fun began.

“We had to change over some parts and pieces to make the unit conform to our safety regulations,” says Ray Greene, CEO of Nakusp Energy.

Nakusp is a village in a heavily timbered area, and its school district was then heating the well-maintained, 100,000 square-foot secondary school with 96,000 liters (25,000 gallons) of liquid propane (LP) gas per year. At an LP price of CA $0.40 per liter, the total annual cost was CA $38,000.

When the renewable-energy system was installed, it combined a wood-heat capacity of 180 thermal kW (600,000 Btu/hour) with a solar hot-water-panel array that covered 24 square meters (260 square feet). The modular plant can burn woodchips, wood pellets, or wood “pucks,” another manufactured form of densified wood. It has a fuel-storage bin that can hold 30 tonnes (33 US tons).

The system would use wood pellets as fuel, although it can also burn chips, the fuel that Greene said he and others would have preferred. But even though Nakusp is in a heavily forested region, the area does not have enough market demand for suppliers to deliver woodchips in such small amounts. Nakusp Energy contracted instead for pellets, delivered from 135 miles away at CA $120 per tonne ($100 US per US ton).

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There was some support for the project within the school. “Our school has a growth plan to move toward sustainability,” says Elaine Tupper, science teacher at Nakusp Secondary. “This project has been an important part of that plan.

“As a science teacher,” she adds, “I love this system, the combination of local biomass and solar. It is a wonderful teaching tool for me.”

‘A Lot of Government Players’
The system was in place for the 2007-08 and 2008-09 school years, but did not operate to capacity—primarily because the local people were having difficulty figuring out the software and controls, with little support from outside.

“We really had to push the protocols on this project,” says Greene, “because there were a lot of government players involved—local, provincial, and federal. We had to make sure everything followed all the codes and regulations. We couldn’t take any shortcuts.”

In its first two years, the plant burned just a fraction of its fuel capacity—15 tonnes of pellets in year one, then 29 in year two.

There was a particularly high level of back-and-forth and scrutiny over the national engineering standards for certifying a pressure vessel of this type. “We lost a whole heating season of operation,” Greene recalls, “because of confusion around the pressure-vessel rules for the wood boiler, how they applied and how they didn’t.”

Another issue was difficulty integrating the heating plant’s operating system with the school’s own controls. “Everyone here in Nakusp knew there would be issues in operating a new kind of system—but so far it has turned out to be a steeper learning curve than we expected,” Greene says.

“The real problem has been the interface between the wood boiler controls and the school’s own control systems.”

Another challenge: the Austrian-designed modular “box” used for fuel storage was set up to be filled from a truck that would blow fuel horizontally into the bin through the side door—but such a truck did not exist in this part of British Columbia. So NEC installed a water-tight hatch in the roof to accept delivery of pellets from a grain truck, with an auger used to deliver the fuel.

The system was finally de-bugged for full-scale operation in spring 2009, two years after it was installed.

One bright side: The system’s solar array pleased not just local teachers but other environmentally concerned Nakusp residents as well.

“I think the solar component did a lot to make local environmentalists comfortable with the project,” Greene says.