A family farm in Närpiö, Finland that raises tomatoes and cucumbers in two large, long greenhouses heats them entirely with biomass, burning woodchips and peat in a modular boiler system that can produce three thermal MW (10 MMBtu/hour).

“Our greenhouses are big and take a lot of heat,” says Stefan Nordmyr, the farm owner. “This year we burned biomass only—no oil. Last year oil prices were down, and we didn’t save much by using biomass.” As oil prices rise, the family expects to accumulate more significant savings.

The farm’s boiler plant is built by Nakkila, and arrived in two pieces—a top and a bottom half of the heating plant, including the building that houses the boiler. The farmers only had to lay down a concrete slab, and put up a simple fuel-storage building.

“The fuel storage building is six meters by 20 meters (20 feet x 65 feet),” Nordmyr says. “The fuel delivery truck can drive right in over the hydraulic scrapers, dump his load, and leave in just a short time.” The trucks have room inside to raise their loadbeds and pull forward as the fuel tumbles out.

“Because the Nakkila boiler plant comes as a modular system, on just two trucks, it goes up very fast,” Nordmyr adds. “It took us only six months to build this entire system.”

Large farm greenhouses like this one have uneven heat needs, less during the day and much more on cold nights. For this reason, the Nordmyr farm’s heating plant also has an accumulator tank, which stands outdoors next to the storage building.

The insulated tank looks like a small silo. It receives heated water from the boiler, and sends it to the greenhouses in flows regulated to meet the fluctuating demand.

The biomass system heats a total area of 15,000 square meters (160,000 square feet). The system’s total cost, including the foundation work and fuel-storage building, was €1.4 million, or $1.8 million US.

Peat Competes with Wood as Fuel

Both peat and woodchips are commonly available in Finland as a fuel source, and they compete for market share. Three forms of peat are available: peat pellets, which look like wood pellets but are a darker brown; peat briquettes, bigger, less dense, and less homogenous than pellets; and “short peat,” which comes in little, roughly cylindrical logs about 12.7 centimeters long and 5-6 centimeters in diameter (5 inches long and 2-2.5 inches in diameter). Short peat is often used in mid-sized heating plants, as it has more energy per weight or volume than wood chips. At large district-energy and power plants, wood and peat fuel are often mixed together.
Ground-up stumps are often produced through land-clearing for peat production in Finland. Trees growing on peat land, generally small diameter, are logged off, then the stumps are pulled and ground up for fuel. Peat is then mined in shallow excavations across the expanse of cleared land. After, the land is replanted with trees. If weather permits, peat is air-dried to reduce its moisture content; it comes from the ground very wet.

“We consider peat to be ‘slowly renewable' because it regenerates over a few hundred years,” says Pekka-Juhani Kuitto, executive director of FINBIO, a nonprofit organization that promotes bio-energy through information and lobbying. “Here in Finland, we harvest peat at a rate slower than it regenerates. We are having a difference of opinion with the EU about whether or not peat is a renewable fuel.”

Nakkila boilers like the Nordmyrs’ are designed to run best on rough fuels, like logging-residue wood, short peat, and ground-up stumps. They use a “wet ash” removal system, which brings ash out in a clumpy slurry and is much quieter and less dusty than automatic dry-ash systems.

“Our market is mostly in Finland and Sweden,” says Mika Rantanen, sales representative for Nakkila Boilers. “We are just starting to sell into Norway. They have been slow to adopt biomass because they have their own oil from the North Sea. Denmark is tough because they only want to use Danish equipment.”

In practice, the Nordmyr family has found peat, though a cheaper fuel, to be harder on its system than chips.

“When there is a wet summer, they have trouble harvesting peat and the price goes up—then we burn woodchips,” Nordmyr says. “Every year it seems like the peat comes from farther away.”