

**NYSERDA
CASE STUDY:
High-Efficiency
Biomass Heating**



**COMMERCIAL PELLET
BOILER**

Company Name
The Wild Center

Location
Tupper Lake, NY
(Franklin County)

Website
wildcenter.org

NYSERDA Funding
\$350,000

“Installing the integrated system saved us more than \$30,000 during the first year. We love that the heating source is supporting the local economy. And it is an educational exhibit that keeps paying dividends—every single day we can tell the story about biomass heating to more people who were unaware of it.”

– Stephanie Ratcliffe,
The Wild Center

The Wild Center Adopts Renewable Heating Technologies

Background

Surrounded by trees and nestled in the Adirondack Region of New York State, members of The Wild Center staff were looking for ways to increase the natural history museum’s sustainability, save money on heating, and use local woody biomass as fuel. Located in Tupper Lake, The Wild Center has about 70,000 visitors each year and had already made sustainability improvements. The Silver LEED®-certified museum has a green roof and a BioBuilding, a laboratory of green building technologies including a solar photovoltaic (PV) array to produce electricity.



The pellet storage bin at The Wild Center is a re-purposed shipping container that also supports a solar thermal hot water system.
Photo courtesy of NYSERDA

Renewable energy provides the potential to heat buildings and hot water without fossil fuels. As oil and gas prices fluctuate, many residential, municipal, and commercial customers are considering lower-cost options, including biomass.

Challenge

New York State’s indigenous biomass fuel is wood, and research supported by NYSERDA shows wood combustion to be a major in-State source of particulate matter emissions. In the U.S., conventional wood burning systems are inefficient and emit high levels of carbon monoxide (CO) and particulate matter, presenting health and safety concerns for consumers and their neighbors. But advanced combustion systems first developed in Europe are more than 85% efficient and have significantly fewer emissions than conventional wood-fired boilers.

Emerging renewable technologies must be optimized through demonstration projects to perform as efficiently and cleanly as possible if they are to displace fossil fuels without introducing air quality and health concerns. To make space heating and hot water at The Wild Center more sustainable, staff volunteered to test out two renewable heating technologies: the first made-in-New York high-efficiency commercial wood-pellet boiler integrated with a solar-thermal, hot-water system.



The Wild Center Adopts Renewable Heating Technologies

Solution

Advanced Climate Technologies LLC (ACT) in Schenectady manufactured and installed the wood-pellet boiler with 500 kW (1.7 MMBtu/hr) capacity under license from a European design firm. A shipping container was repurposed as a pellet storage tank to fit in with the aesthetic of The Wild Center. CS Arch of Albany, NY, designed and E2G Solar of Chatham, NY, installed the solar thermal, hot-water system. The system consists of two types of solar collectors (flat panels and evacuated tubes), which absorb heat from sunlight. The collectors are mounted on the south side of the wood-pellet container roof. The solar loop of the system contains a mixture of 40 percent antifreeze.

The integrated system was designed to satisfy two main objectives. First, the harvested solar energy can indirectly cover most, if not all, of the domestic hot water needs in The Wild Center's Waterside Café. Second, any excess harvested solar energy is stored and released as needed to the main hydronic loop in The Wild Center's basement to essentially pre-heat the water for space heating purposes.

The benefit of the solar thermal system is that the excess harvested solar energy released to the space heating loop reduces the firing demand and cycling of the boiler particularly during fall and spring. In essence, the sun heats the water/antifreeze mix in the solar loop, which in turn heats a tank of water in the basement that is then used to heat domestic hot water.

NYSERDA funded 75 percent of the installation cost for this demonstration project through its Biomass Heating R&D program. The Wild Center and private donors sponsored the remainder.

Results

ACT installed the boiler and integrated it with a solar-thermal hot water system in April 2010. Compared to the prior year, The Wild Center heating costs following the installation of the ACT pellet-fired boiler and solar thermal system were reduced by \$31,653.

Researchers at Clarkson University also conducted a rigorous, third-party scientific evaluation of the integrated system's efficiency and emissions performance during spring 2010 and 2011 heating season. The boiler operated most efficiently at a full load in steady-state.

Plans are underway to further optimize the pellet boiler heating system by adding two 850-gallon thermal storage tanks to allow for quicker response during a call for heat, more operation of the boiler at high load, and less cycling of the boiler to meet low heating loads. It is anticipated that the heating system will have a payback of approximately 10 years.

Stephanie Ratcliffe, executive director of The Wild Center, explained the educational benefits. Normally just one day of work, the installation of the solar thermal system became a three-day, hands-on training session for 25 attendees. In addition, the integrated heating system became part of a comprehensive educational display at The Wild Center. More than 5,000 visitors have taken the "New Path" tour, which showcases the system and how elements of green design benefit the health of the human and natural world.



Advanced Climate Technologies built the first made-in-NYS commercial high-efficiency wood pellet boiler, which was installed at The Wild Center. Photo courtesy of The Wild Center

For more information, see NYSERDA. 2013. "The Wild Center Renewable Heating Demonstration: High-Efficiency, Commercial-Scale, Wood-Pellet Boiler Integrated with a Solar Thermal System," NYSERDA Report 13-08, <http://www.nyserda.ny.gov/Publications/Research-and-Development-Technical-Reports/Biomass-Reports.aspx>

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